CECASE

Centre of Excellence in Corrosion And Surface Engineering

(A marathon venture on transformation from the
Present State-of-Art to the Centre of Excellence in niche and frontier areas)

National Institute of Technology
Tiruchirappalli - 620 015
Tamilnadu, India.
website : www.nitt.edu
email : cecase@nitt.edu

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Introduction

The National Institute of Technology, Tiruchirappalli is one of the most pioneering educational institutions in the country serving the Society for the cause of Technical Education for more than four decades. It has been always striving so hard with great enthusiasm and charm to keep itself abreast with the latest developments in science and technology that occur in and around the world.

The need for setting up of the CECASE Centre:

The world is drifting today in pursuit of knowledge, based on scientific and technological developments which pertain to, since recent past, the multidisciplinary nature of three important domains namely
(a) information technology (b) biotechnology and (c) nanotechnology.

The development of new class of materials has surpassed even some of the well established conventional discoveries made over the past. The civilization of any country eventually depends mainly on (i) the men and (ii) materials. The men constitute customs and manners and materials, the means of their livelihood.

In this modern world, focus is made on every effort made by the scientific community to convert any class of materials into effective utilization for engineering and technological applications. In this context, every engineering material is very much prone to encounter tribological and corrosive environments during the course of its service conditions.

Let us analyse some probable reasons:

Why Corrosion testing?

- Most of the engineering materials are prone to the phenomenon of corrosion. It is estimated that our country loses around 4.5% GNP every year due to metallic corrosion involving several thousands of crores of rupees.
- To assess the corrosion behavior in terms of reliability of materials and reproducibility in experimental data for a given service environment.
- To have an in-depth study of the mechanism of corrosion.
- To suggest suitable measures for corrosion protection.

Why engineer surfaces / Surface Engineering?

- Surface property of any material is regarded as a primary function: The bulk of the material beneath acts as a "carrier" may need to be strong, elastically stiff, tough, insulating or whatever depending on application, but whatever the surface does is the essential function.

- Surface property as Protection: The bulk of the material beneath is doing the main job supporting a load or whatever, but needs protection from surroundings, which may be chemically aggressive or erosive, abrasive, etc…

- Surface state different from bulk as a result of processing or servicing. Shaping process or service conditions produce a surface different from the bulk. May be to monitor condition, or re-engineer.

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Problems encountered in many industries, related to corrosion damage and surface protection, no doubt, have been addressed by many organizations but an integrated facility even on regional basis in India appears to be lacking for suitable redressal.It is hence contemplated to create a central facility which can cater to the requirements of industries at all levels (small scale, medium, and large scale) and also the research scientific community. Unless the Centre enjoys a complete spectrum of expertise drawn from all fields of discipline related to man power, equipment and infra structure, it will not be able to accomplish the desired goal. Hence the present proposal.

How CECASE will operate?

The Management of the National Institute of Technology has already been convinced on the need for Centres of excellence, such as the CECASE. A special task force has been duly formed with members from a wide range of departments. The management of the institute, with input from the Board of Governors, Council of Deans and liaison especially from Dean (P&D) and Dean (R&C) will evolve the operational mechanism and details. The Centre will be initially provided with seed funds by the institute, subsequently will be funded by external sponsors and, by the year 2014, the Centre is desired to be self sufficient. For the proposed Centre steps have been initiated to sign MoU with user industry such as BHEL,Trichy and L&T. An MoU has been recently signed with CECRI, Karaikudi. The proposed Centre will operate closely with industry and other research institutions. The objectives of the Centre are reproduced here, for the record.

Objectives of the CECASE

1. To design and develop necessary infrastructure with respect to procurement of instruments/equipment required for multi disciplinary nature of research pertaining to the theme of the Centre.
2. To provide necessary manpower in terms of scientific, technical and secretarial staff.
3. To constitute Advisory Boards with experts of national and international repute.
4. To start an academic curriculum in M. Tech Corrosion and Surface Engineering.
5. To identify small, medium and large scale industries working on the theme of the Centre and prepare a data bank.
6. To achieve liaisons with industries of good standing working on the theme of the centre.
7. To enter into MoU with academic institutions, R & D institutes and industries of repute for effective and efficient interaction to achieve the desired goal.
8. To publish a Newsletter pertinent to the theme towards dissemination of knowledge all over the globe.
9. To organize short term courses, national and international conferences pertinent to the theme of the Centre.
10. To document the case studies on corrosion failures in order to identify emerging areas to be addressed for future education, research, consultancy and testing orienting to the theme of the Centre.

Budget for CECASE

An initial outlay of Rs. 48.00 Crores has been envisaged as a budgetary estimate for three years functioning from 2012 onwards which includes a building component as infrastructure facility at an approximate cost of Rs. 10.00 Crores. The proposed CECASE Centre is desired to become Self Operational in the Calendar year 2014.

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Expert Members of STF - CECASE as on 26-02-2012

To accomplish the task of establishing CECASE, a special task force has been duly constituted.

Sl. No.	Name of Faculty / Dept. Designation	Areas of Expertise / Interest	Other positions held (if any)
1	Prof.S.Natarajan Professor / MME, Chairman	Weldment Corrosion and its Control in Power, Process and Petrochemical Industries, Surface Engg., Tribology, Protective Coatings, Development of new materials for Ultra critical super boilers, Fireside Corrosion, Hot Corrosion	Ex- Prof & HoD/MME Ex. Nodal Officer (Academic-TEQIP phase I)
2.	Dr. S. Raman Sankaranarayanan Associate Professor / MME	Process metallurgy, Process modelling, Quality management.	HoD/MME Nodal Officer (Legal Cell) Former Associate Dean (Academic)
3.	Dr.S.P.Kumaresh Babu Associate Professor / MME	Corrosion, Surface Engg. Foundry Engg.	Nodal Officer (Equity Plan-TEQIP phase II)
4.	Dr.R.Karvembu Associate Professor / Chemistry	Inorganics, Nano materials, Catalysis.	HoD/Chemistry
5.	Dr.A.Sreekanth Assistant Professor / Chemistry	Spectroscopy, Inorganics, Corrosion Inhibition, Sensors.	---
6.	Dr.M.Matheswaran Assistant Professor / Chemical	Electrochemical Engg., Waste water treatment, Membrane Processes.	---
7.	Dr.J.Karthikeyan Assistant Professor / Civil	High Performance Concrete and Materials, High Performance Prestressed Concrete Bridges, Design.	---
8.	Dr. P. Sathiya Associate Professor / Prodn.	Solid State Joining, Materials Behavior Subjected to Welding.	Nodal Officer (Academic-TEQIP phase II)
9.	Dr.-Ing. M. Duraiselvam Associate Professor / Prodn.	Laser Surface Engg., Intermetallic Alloy Development, Tribology.	---
10.	Dr. S. P. Sivapirakasam Associate Professor / Mech.	Industrial safety, Total Quality Management.	---
11	Dr.R.Anand Assistant Professor / Mech.	Gas Dynamics, Jet Propulsion,Tribology, Fuels & Combustion.	---
12.	Dr. G. Lakshminarayanan Associate Professor / ECE	VLSI Signal Processing, Asynchronous Systems.	---
13.	Dr. G. Saravana Ilango Assistant Professor / EEE	Power Electronics Controllers, Power Quality	---
14.	Dr.K.Srinivasan Assistant Professor / ICE	Process Control, Instrumentation.	---
15.	Dr. V. J. Sivakumar Associate Professor / MBA	HR, Product and Brand Management, Entrepreneurship.	---
16.	Prof.V.Sivan Professor (on contract) /MME, Advisor	Corrosion & Surface Engg., Welding Engg.	Former Director incharge,NITT

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Expert Members of STF - CECASE

Prof. S. Natarajan
Chairman

Dr. S. Raman Sankaranarayanan

Dr. R. Karvembu

Dr. S.P. Kumaresh Babu

Dr. -Ing. M. Duraiselvam

Dr. P. Sathiya

Dr.G. Lakshminarayanan

Dr.V.J. Sivakumar

Dr.S.P. Sivapirakasam

Dr. M. Matheswaran

Dr. A. Sreekanth

Dr. G. Saravana Ilango

Dr. K. Srinivasan

Dr. J. Karthikeyan

Dr. R. Anand

Prof. V. Sivan
Advisor

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Notable Awards/Fellowships received by STF / CECASE members

Name	Awards and Fellowships
Prof.S.Natarajan, Chairman	Shri. S.K.Seshadri Memorial MASCOT National Award 2008 from ECSI, IISc., Best Teacher Award from NITT -2007 Best Project Guide Award (DTE Govt. of Tamilnadu)
Dr.Karvembu	Senior Research Fellowship- CSIR Young Scientist Award - DST
Dr. A. Sreekanth	Young Scientist Award in 2010 from DAE-BRNS
Dr.Durai Selvam	German DAAD Fellowship Young Scientist Award - DST
Dr. G. Lakshminarayanan	Received a Patent, Fabricated a Chip on 0.18 µm Technology through INDIA Chip 2010 programme under SMDP Project. Fabricated a FPGA board for LRDE, Ministry of Defence, Bangalore
Dr.P.Sathiya	Young Technology Award'2009 from IWS Best Teacher Award'2009 /NITT Raiser innovation award for friction welding 2011, Klaus Raiser gmbh, Zeppelining, Eberdingen-Hochdorf, Germany.
Dr.Saravana Ilango	Best Project Award (DTE Govt. of Tamilnadu)
Dr. K.Srinivasan	Young Scientist Award - DST
Prof.V.Sivan (on contract) Advisor	Distinguished Educator award (IIM) Binani Gold medal (IIM) KCP award

Note : Besides above, almost all members of CECASE Team have received many best research paper awards in various conferences of National and International repute.

List of Journals of repute to which expertise is offered (consistently for 2 years and above) by CECASE members for review of technical articles. (List partial)

Surface Engineering (Maney Publications,UK), Materials and Manufacturing (Taylor and Francis), Tribological International (Elsevier), Materials and Design (Elsevier), Materials Physics and Chemistry (Elsevier), Bulletin of Electrochemistry (CECRI Karaikudi), Inorganic Chemistry Communications (Elsevier), Journal of Molecular structure (Elsevier), Analytical Methods (RSC,UK), Dalton Transactions (RSC,UK), Materials Science and Engineering A (Elsevier), Surfaces and Coatings Technology (Elsevier), Journal of Hazardous Materials (Elsevier), Journal of Advanced Materials Technology (Springer), Materials Letter (Elsevier), Journal of Chemical Engineering (Elsevier), Energy and Fuels Society (American Chemical society), Industrial Electronics, IEEE

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Patrons for STF-CECASE, NITT

Prof. Rajaram Nithyananda,
Chairman, Board of Governors,
NIT,Tiruchirappalli
& Patron, CECASE,NITT.

Prof. Rajaram Nityananda is an Indian physicist who is Internationally well known for his research work on Astronomical Optics, Image Processing & Gravitational Dynamics. He was formerly the Director of the National Centre for Radio Astrophysics, Pune. He is currently the Associate Editor of the Journal of Astrophysics & Astronomy published by the Indian Academy of Sciences.

Dr. Srinivasan Sundarrajan,
Director, NIT,Tiruchirappalli
& Patron, CECASE,NITT.

Dr.Sundarrajan's contribution for development and production of prestigious missile systems: Prithvi, Agni, Akash and Brahmos, spans over three decades. He was leading BRAHMOS programme team and just completed a massive indigenisation project that has enabled cost reduction and schedule compression. He has also designed and developed over 1,000 products and processes for aerospace systems, and has an impressive background in academic inter-disciplinary research, institute-industry interaction, and technology development and transfer.

Dr.Sundarrajan networked over 400 industries and 40 academic institutions for R&D leading to quality products and positioned them in National Supply Chain Grid. An INAE (Indian National Academy of Engineering) – AICTE Distinguished Professor, Dr.Sundarrajan has made significant contribution for curriculum development integrating emerging areas of technology. He saw through the formation of foundry clusters and modernised industries in SME sector into quality export-oriented units in Andhra Pradesh.

More than 30 of his research projects are being executed by academic institutions and industry. His project on Energy Audit and Conservation through shop-floor oriented R&D has been appreciated by international agencies working on Energy. Dr.Sundarrajan completed Mechanical Engineering from Thiagarajar College of Engineering, Madurai, and did his post graduation and doctorate degrees at the Indian Institute of Technology, Madras, in Industrial Metallurgy. He also has a PG certificate from Indian Statistical Institute, and had his initial training at Ashok Leyland.

As member of TIFAC (Technology Information, Forecasting and Assessment Council) national team, he was instrumental in making 2020 vision documents in the area of materials.

He serves as member of various boards/ committees of ISRO, DAE and CSIR, and has edited two engineering hand books and published more than eighty technical papers. Seven researchers have completed doctorates under his guidance. The recognitions he won include UNESCO Fellowship (1988), Best Metallurgist of the Year Award from the Govt. of India (1992), Vishwa Bharathi Award for Professional Excellence (1999), Performing Team Award (2004), and Best JV Management Award (2008).

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Advisory Board Members for STF-CECASE, NITT (List Partial)

Dr. T.S. Sudarshan
Chairman, International Advisory Board, CECASE, NITT.

Dr. T.S.Sudarshan is currently the President and Chief Executive Officer for Materials Modification Inc., (MMI) Fairfax, Virginia where he has raised over 30 million dollars in funding from the Government for high risk high payoff advanced technology related programs.

Dr. Sudarshan most recently completed a 6 year term as a member of the "National Materials Advisory Board" He is holder of 12 US patents and 1 Australian patent; winner of two R&D 100 awards; winner of two Design News awards; winner of the Outstanding Manufacturing Engineer award given by the Society of Manufacturing Engineers - USA; Fellow of ASM International; Fellow of International Federation of Heat Treatment and Surface Engineering; coauthor of over 150 papers in journals and peer reviewed conferences; coeditor of 25 books - 22 in surface engineering, one on "Rapid Solidification Technology", one on "Intermetallic and Ceramic Coatings", and one on "Chemical Vapor Deposition"; and has delivered over 25 invited (keynote and plenary) lectures in the fields of nanotechnology and surface engineering around the world.

Dr. Sudarshan is also the founder of the "Surface Modification Technologies" conference that has been held for the past 20 years in various countries that include USA, UK, France, Japan, Singapore, Switzerland, India and Austria and serves on the editorial boards of several international journals. Dr. Sudarshan is also the Co-editor of two international peer reviewed journals "Materials and Manufacturing Processes" published by Taylor and Francis for the past 20 years and "Surface Engineering" published by Maney Publishing on behalf of IOM, UK for the past 11 years. He has been profiled in Wall Street Transcripts on Nanotechnology and has served as a member of the Governor's Review panel on Research and Development in the Commonwealth of Virginia.

Prof. Sundar Atre
Member, International Advisory Board, CECASE, NITT.

Associate Professor
Dept of Industrial & Manufacturing Engineering
Rogers 324
541-737-8272
Oregon State University (USA)
Sundar.Atre@oregonstate.edu

Dr. Atre's research focuses on advanced materials and manufacturing techniques for multiscale architectures with applications in the transportion, energy, medical, communications, and consumer sectors.

After graduating in Chemical Engineering from IIT Madras, Chennai; he moved over to US for his higher studies. He obtained Ph.D. in Materials Science and Engineering. He held several positions since then which include Founding Partner and President, Asthetic Materials LLC, during 1992- 2002, concurrently holding the position of Director of Polymer Chemistry, Center for Innovative Sintered Products, Penn State followed by Board of Directors, INTC. Presently he is Associate Professor.

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Dr. U. Kamachi Mudali,
Member, National Advisory Board, CECASE, NITT.

Associate Director, Corrosion Science and Technology Group, Head, Reprocessing Research and Development Division, and Head, Technology Transfer Cell, is at Indira Gandhi Centre for Atomic Research, Kalpakkam, India since 1984 after completing M.Tech (Corrosion Sci. & Engg.) from IIT Bombay. He is a well known materials and corrosion specialist in the area of development of advanced materials and coatings for aggressive environments, localised corrosion, and corrosion monitoring and corrosion protection technologies.

Dr. Mudali has published 211 papers in peer reviewed journals, 180 in proceedings, books and internal reports, 1 encyclopedia article, 155 plenary, keynote and invited lectures, 10 edited books and proceedings, and has 3 patents to his credit. He has average citation of 7.8 per paper and the h-index is 20 without self-citation. He is a Professor and Faculty Member of the Homi Bhabha National Institute (University), Mumbai, and an Adjunct Professor of PSG College of Technology, Coimbatore. He has guided and coordinated thesis work of 109 B.Tech., M.E., M.Tech. M.Sc., M.Phil and PhD students at IGCAR, Kalpakkam. He has been a visiting scientist at leading institutions in Germany, Japan, France, UK, and Israel.

Notable awards received: Tamil Nadu Scientist Award (1997), National MASCOT Corrosion Award (2000), ONGC Excellence in Corrosion Award (2003), Homi Bhabha Science and Technology Award (2004), National Metallurgists Day Award (2005), Indian Nuclear Society Medal (2005), NACE Meritorious Contribution in Corrosion Award (2009), DAE Group Achievement Award (2011). He is a Fellow of Indian Institute of Metals (2006), Indian National Academy of Engineering (2009), Institution of Engineers (2009), and Tamil Nadu Academy of Sciences (2010).

Editor / Member of Editorial Boards in journals of (i) Corrosion Reviews, (ii) Surface Engineering, (iii) Transactions of IIM, (iv) Materials and Manufacturing Processes, and (v) Journal of Materials Science and Technology. He is President of NACE International Gateway India South Zone, Vice Chairman of ASM International Chennai Chapter and National Corrosion Council of India, Karaikudi

Dr. B. Venkataraman,
Member, National Advisory Board, CECASE, NITT.
Head, Surface Engineering Group ,
Defence Metallurgical Research Laboratory,
Hyderabad.

Dr.B.Venkataraman has received M.Sc(Physics) from Madurai - Kamaraj University, M.Tech (Materials Science & Technology) and Ph.D (Metallurgical Engineering), both from Banaras Hindu University. For the 25 years, he has been working as a scientist at Defence Metallurgical Research Laboratory (DMRL). Dr. Venkataraman made extensive contribution in the field of Tribology, Surface Engineering. He has published over 75 papers in international journals; many of them are cited well. He spearheaded a programme for developing variety of coatings for an indigenous aero engine. As a part of his research, he developed a number of sophisticated experimental techniques such as abradable test rig, high velocity gas gun, high temperature high stress tribo test rig etc. has delivered a number of invited lectures in national and international conferences. He has been guiding for Ph.D thesis; 3 of them are already awarded and two more are in progress. In addition he has guided more than15 M.Tech project dissertations. He has served as an expert member in a number of project review boards/committees of DRDO,DST and CSIR. He has been Ph.D thesis examiner for IISc, IIT-M and NIT etc in the field of Metallurgy, Materials Science and Mechanical Engineering. He also contributed in formulating syllabus for the subject "Surface Engineering" for post graduate students in some of the educational institutions. He is presently heading the Tribology Group at DMRL.

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Project Proposals received for Consideration and Execution under CECASE

a) From CECRI, Karaikudi (MoU Signed)

1. Corrosion propagation models of HPC mixtures.
2. Studies on SCC of Cr-Mo boiler steel weldments used in Power plants.
3. Development of Solid film Lubricating Coatings for better corrosion resistance and tribological properties.
4. Low complexity Energy efficient Handheld Electro chemical Analyser.

b) From various public sectors and private industries

1. Hot / steam corrosion related to boiler materials.
2. Corrosion studies at simulated boiler conditions.
3. New boiler materials and their weldment's corrosion.
4. Stress corrosion of boiler components & their weldments.
5. Prevention of corrosion using different coatings on boiler components.
6. Surface protection, painting of oil field equipment for off-shore applications.
7. Alternate treatment for hard chrome plating in valve stem for wear and galling resistance.
8. Alternate treatment for surface protection of fasteners.
9. Projects on painting and specialized surface preparation.
10. Low temperature corrosion in air heater due to sulphur dioxide & chlorine in flue gas.
11. Erosion resistant coating on refractory in target area of cyclone.
12. Studies on corrosion behavior of SMAW / SAW austenitic stainless steel weldments / claddings for pressure vessel components.
13. Tube thickness erosion in CFBC combustor at refractory interface.
14. Enhancing life of belt conveyors and rollers used in coal/lignite mines by surface modification technologies.
15. Prevention and analysis of premature failures of track plated, track link and track link pin of bucket elevators used in coal mines.
16. To improve the corrosion resistance of Drive chain.

Prof.S. Natarajan, Chairman, Special Task Force highlighting the need for establishment of the centre - CECASE, the other dignitaries on the dias are : Dr. G. Kannabiran, Dean (R&C), Prof. Rajaram Nithyananda, Chairman, Board of Governors,NIT,Tiruchirappalli & Patron, CECASE,NITT., Dr. T. Ramasami, Secretary, DST and Dr. S. Sundarrajan, Director, NITT

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Project Proposals under submission to DST, Govt. of India by CECASE team

Sl.No.	Name of the Principal Investigator (PI)	Title of the Project Proposed
1.	Dr.G.Saravana Ilango / EEE	Corrosion Enabled Powering Approach for remote monitoring of corrosion in RC structures
2.	Dr. A. Sreekanth / Chemistry	Development of Modified Nickel Nano Composite Coatings for Better Corrosion Resistance and Tribological Properties
3.	Dr. R. Anand / Mechanical	Multiwall carbon nano tubes for increased fuel efficiencies, lubricant tribological properties and Graphene oxide based catalysts for Emission Control in Heat Engines
4.	Dr M. Matheswaran / Chemical	Synthesis And Development of Mixed Metal Oxide Nano-material for Detoxifying Chemical Warfare Agents
5.	Dr. S. Raman Sankaranarayanan / MME	Thermodynamic modeling for determination of corrosion potential of carbon dioxide transport pipeline used in sensitive environments
6.	Dr. R. Karvembu / Chemistry	Mechanism and Action of Corrosion Inhibition Behavior of Functional Graphene Oxide Nano particles and Heteropoly Anions
7.	Dr.K.Srinivasan / ICE	Corrosion Estimation Techniques using Linear and Non-linear State Estimation Techniques
8.	Dr.P.Sathiya / Production	Stainless surfacing on ultra high strength low alloy steel and ultra-fine grained low carbon steel for aerospace and marine applications
9.	Dr.-Ing.M.Duraiselvam / Production	Laser clad Thermal Barrier Coatings (TBC) for Gas Turbine Blades
10.	Dr. S. P. Kumaresh Babu / MME	Development of CNT reinforced aluminium based nanocomposites through liquid melt route followed by severe plastic deformation
11.	Dr.G.Lakshminarayanan / ECE	Wireless based Corrosion Monitoring System for Defence Applications

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A Professional Appeal:

The Management of National Institute of Technology, Tiruchirappalli, India, in its continued earnest efforts of disseminating knowledge in the field of Corrosion and Surface Engineering is firmly determined and fully committed to spearhead its activities further in all possible ways to accomplish its desired goal namely establishment of the **C**entre of **E**xcellence in **C**orrosion **A**nd **S**urface **E**ngineering **(CECASE)** during the calendar year 2014 **(Golden Jubliee Year of the NIT, Tiruchirappalli)**. Hence in this context, a fervent appeal is made to all users of this scheme namely Academic Institutions, Engineers, Scientists, Industrial Organisations, Educationists, Entrepreneurs, various governement agencies and public/private sectors to come forward for technical collaboration and effective interaction with the Special Task Force intended for CECASE and make this dream of NITT, a reality.

- Dr.Srinivasan Sundarrajan,
Director, NIT,Tiruchirappalli

Contact Address:

The Chairman,
Secretariat, Special Task Force for
Centre of Excellence in Corrosion And Surface Engineering (CECASE),
National Institute of Technology, Tiruchirappalli - 620 015, INDIA.
Tel.: 0431 - 2503456 Fax : 0431 - 2500133 Mobile : 9486001136
email : cecase@nitt.edu website : www.nitt.edu

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